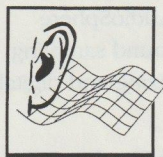


VPL



## Key Features

- Spatialization of Real-Time, Recorded, and Computer Generated Sound Sources
- Motion Rendering and Special Effects
- Simulation-Based Control Over 3D Virtual Realities
- Compatibility with the RB2 Virtual Reality System
- Computerized Sound Generation Capabilities
- Complete Stand-Alone Hardware/Software System
- Four Channels of Simultaneous Spatialized Sound
- 16 Bit Digit Audio Output

## Description

AudioSphere<sup>TM</sup> is a three-dimensional, real-time sound rendering system for virtual reality and other applications. The system provides signal processing capabilities to convert monaural sounds to fully spatialized sound sources. An AudioSphere user wearing a pair of stereo headphones perceives live, computer generated, or recorded sounds as coming from specific locations in space, just as a listener does in the real world.

AudioSphere provides an optional simulation toolkit, called Body Electric<sup>TM</sup>, to design entire aural virtual realities with sound source motions and behaviors. In addition, Body Electric processes external signals such as outputs from MIDI devices or VPL's DataGlove to control the aural virtual reality.

The system consists of software and three major hardware subsystems.

The sound generation subsystem is responsible for creating and generating monosound sources for the AudioSphere.

The control and processing subsystem directs the sound source spatial positioning. Included in the subsystem is the Convolvotron<sup>TM</sup> (designed by Scott Foster of Crystal River Engineering, Inc.) which performs the signal processing tasks to convert the mono sound sources to three-dimensional sources.

The output subsystem provides multiple stereo output channels with volume control for the final rendered sound.

## Applications

### Realistic Sound Rendering for Simulators

AudioSphere is an ideal system for

providing auditory information for motion simulation applications such as automobile simulations. AudioSphere's ability to localize sound anywhere around the user creates a higher level of verisimilitude than traditional systems such as stereo.

### Motion Picture, Radio, and Advertising Production

AudioSphere's spatialized sound outputs can be recorded and played back with existing stereo technology. The playback will reproduce above/below and front/back cues, as well as left and right cues. The spatialized sound can be used to create sound for movies, advertisements, or other



recordings where three-dimensional realism or exaggerated effects help hold the audience's attention.

### Virtual Reality Feedback

When a user touches an object in a virtual reality, AudioSphere can generate a realistic sound cue to indicate contact with the object providing an alternative to actual tactile and/or force feedback. Also, objects such as virtual instrumentation can have audio "read outs" including synthesized voices.



## Audio Communications

AudioSphere adds an extra channel of information to normal audio communications such as teleconferencing. Each teleconference member can be assigned a specific location around a user to help the user distinguish who is speaking.

## Key Features

### Spatialization of Real-Time, Recorded, and Computer Generated Sound Sources

AudioSphere processes a wide variety of sound sources such as live human voices (a studio microphone is provided), tape recordings, or computer generated and stored sounds. AudioSphere spatializes the sounds without noticeable time lag by using the high speed processing power of the Convolvotron™, a 320 MIPs digital signal processor.

### Motion Rendering and Special Effects

Body Electric generates the control signals for realistic or exaggerated aural effects such as Doppler shift for objects in motion in the virtual reality.

### Simulation-Based Control Over 3D Virtual Realities

AudioSphere users can easily animate sound sources and/or the listeners view point with Body Electric. Also, Body Electric allows the creation of behaviors and interactions of sound sources that mimic sound source interactions and behaviors in the real world.

### Compatibility with the RB2 Virtual Reality System

AudioSphere was designed to be fully compatible with VPL's RB2 Virtual Reality System. An RB2/AudioSphere System user perceives sound as emanating from specific objects in a virtual reality including the voices of other users in a shared virtual reality.

### Computerized Sound Generation Capabilities

The sound generation subsystem which contains the 16 bit Emax II™ Digital Synthesizer/Sampler/Sequencer

places many sound studio capabilities at the fingertips of the AudioSphere user. Features include sound sampling, editing, mixing, synthesizing and digital processing.

### Complete Stand-Alone Hardware/Software System

AudioSphere contains all the necessary hardware and software to generate, spatialize, and output sound sources, and can be used as a stand-alone system for use with sound mixing or simulation systems.

### Four Channels of Simultaneous Spatialized Sound

The AudioSphere accommodates up to four channels of real-time, spatialized sounds. Also, program control offers the capability to switch between multiple banks of up to four simultaneous sounds.

### 16 Bit Digit Audio Output

AudioSphere produces a single stereo signal with 16 bits of resolution. A headphone driver provides volume control and 4 outputs of the stereo signal.

## Specifications

### Sound Acquisition/Generation Subsystem

#### RAM Capacity

2M bytes (1M samples) expandable to 8M bytes

#### Disk Storage Capacity

720K floppy disk, 40 Meg Hard Disk (standard), 45 Meg Removable Hard Disk (optional)

#### Sampling Rates

20 kHz to 39kHz

#### Total Sound Capacity

96 seconds with 4 meg system at 20 kHz sampling rate, 48 seconds with 4 meg system at 39 kHz sampling rate

#### Dynamic Range

Input: >90 dB

Output: >102 dB

#### Signal to Noise Ratio

>90 dB

## Frequency Response

20 Hz - 19kHz

## Control and Processing Subsystem

### Signal Processing Performance

320 million multiply-accum-shifts/sec

### Total # of Sound Sources

4 spatialized objects at 50 kHz

### Processing Delay Average

41 milliseconds

### Inputs

4 inputs - synchronized 16-bit A/D converters running at up to 50 kHz

### Outputs

2 outputs - separate 16-bit D/A converters synchronized to the A/Ds

### Signal to Noise Ratio

> 85 dB

### Frequency Response

0 Hz - 25 kHz

### Power Requirements

110 VAC, 60 HZ, 50 watts

## Output Subsystem

### # of Outputs

4

### Signal to Noise Ratio

> 85 dB

# VPL

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Specifications subject to change without notice.